



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
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January 29, 1997

F/NW03

MEMORANDUM FOR: F/NW - William W. Stelle, Jr.
THROUGH: F/NW03 - Elizabeth Holmes-Gaar
FROM: F/NW03 - Steven W. Landino
SUBJECT:

Endangered Species Act Section 7 Conference Report, Unlisted
Species Analysis, and Section 10 Findings for the Washington
State Department of Natural Resources Habitat Conservation Plan

The Washington Department of Natural Resources (DNR) has applied to the U.S. Fish and Wildlife Service (USFWS) for an incidental take permit for northern spotted owls and a variety of other listed species, under Section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended. DNR has also requested that the National Marine Fisheries Service (NMFS) and the USFWS (collectively, the Services) enter into an "unlisted species agreement" to conserve currently unlisted anadromous salmonids and other fish and wildlife species which are dependent upon habitats analyzed in their Habitat Conservation Plan. The DNR proposes to manage its lands in the planning area pursuant to the HCP and Implementing Agreement (IA). The IA describes the responsibilities of the DNR and the Services in these agreements.

This memorandum accompanies our Endangered Species Act Section 7 Conference Report, Unlisted Species Analysis, and Section 10 Findings for the Washington State Department of Natural Resources Habitat Conservation Plan. This document constitutes our effects analysis under Section 7, and our findings for permit issuance under Section 10, and establishes a basis for providing assurances to the DNR that NMFS has agreed, pursuant to the unlisted species provisions of the IA, to grant an incidental take permit to the DNR when and if anadromous salmonid species become listed in the future.

Based on this analysis, the DNR HCP meets the statutory and regulatory requirements for an Incidental Take Permit under Section 10(a)(2)(B) of the ESA and 50 C.F.R. 222.22(c)(2). As such, all requirements of the NMFS are fulfilled and the Northwest Region Habitat Program recommends that you sign the Implementing Agreement for the DNR HCP, and approve the accompanying Endangered Species Act Section 7 Conference Report, Unlisted Species Analysis, and Section 10 Findings for the Washington State Department of Natural Resources Habitat Conservation Plan.



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ENDANGERED SPECIES ACT - SECTION 7
CONFERENCE REPORT,
UNLISTED SPECIES ANALYSIS, AND SECTION 10 FINDINGS

for the Washington State Department of Natural Resources
Habitat Conservation Plan

Agency: National Marine Fisheries Service

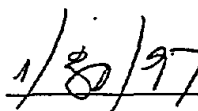
Conference

Conducted By: National Marine Fisheries Service
NW Region
Olympia Field Office

Approved



Date



William W. Stelle, Jr. Regional Administrator

I. BACKGROUND

This document constitutes the National Marine Fisheries Service's (NMFS) conference report and findings in accordance with Sections 7 (a)(4) and 10 (a)(2)(B) of the Endangered Species Act of 1973 (ESA), on the issuance of an unlisted species agreement to the Washington State Department of Natural Resources (DNR) based upon its Habitat Conservation Plan (HCP) and Implementation Agreement (IA).

Though the anadromous salmonids that are addressed in the DNR HCP which occur on the west side of the Cascade Crest are currently unlisted at this time, and thus not protected under the ESA nor subject to the provisions of Sections 7 and 10, the NMFS has agreed pursuant to the unlisted species provisions of the IA, to grant an incidental take permit to the DNR when and if anadromous salmonid species become listed in the future. This document provides the rationale and biological basis for making that decision, structured by the administrative requirements of Sections 7 and 10.

Based on this HCP and IA, the U.S. Fish and Wildlife Service (Service) would issue a Section 10 (a)(1)(B) incidental take permit to DNR for the northern spotted owl; the marbled murrelet; the Oregon silverspot butterfly, Aleutian Canada goose, bald eagle, peregrine falcon, gray wolf, grizzly bear, and the Columbian white-tailed deer. The Service has completed an analysis of the effects of this HCP on the fish and wildlife species under their jurisdiction.

Over the last several years, the Service and the NMFS (together the Services) provided technical assistance to the DNR during the HCP development and cooperated with the DNR in the preparation of an Environmental Impact Statement (EIS). In April of 1996, the Services received a completed application package from the DNR. The distribution to interested parties was initiated and a Federal Register notice was published on April 5, 1996 (61 FR 15297) (USDI 1996a), which announced the release of the draft HCP and Implementing Agreement (IA), permit application and draft EIS to the public. The comment period closed on May 20, 1996.

The Services addressed concerns raised about the HCP and discussed alternative approaches with DNR. Upon completion of these discussions, and after addressing the public comments, the Services and the DNR prepared a Final Environmental Impact Statement, including sections highlighting the changes made to the HCP and IA. The Notice of Availability of a final EIS (FEIS) was published in the November 1, 1996, Federal Register (61 FR 56563) (USDI 1996b), with the 30 day waiting period ending on December 2, 1996.

This analysis is based on information provided in the HCP, the FEIS, technical papers prepared to support the HCP, and various other documents cited later in this document and listed in the References Section. A complete administrative record on this conference is on file in the National Marine Fisheries Service's Olympia Field Office.

II. PROPOSED ACTION - PROJECT DESCRIPTION

The Washington Department of Natural Resources has applied to the U.S. Fish and Wildlife Service and National Marine Fisheries Service for an incidental take permit under Section 10(a)(1)(B) of the Endangered Species Act of 1973, for both timber harvest and non-timber harvest activities that may occur on DNR lands during the 70 to 100 year term of the HCP and incidental take permit. The proposed HCP provides mitigation for the incidental take of nine federally listed species, including the northern spotted owl and the marbled murrelet. This mitigation includes providing habitat for the listed birds, as well as managing so as to minimize take of the other listed species within the range of the spotted owl. The proposed HCP would also conserve habitat for a multitude of unlisted species west of the crest of the Cascade Range. These include western Washington runs of salmonids and other species west of the Cascade crest that are candidates for listing by the federal government or the state. In addition, the proposed HCP would provide habitat for other species that may become listed or candidates in the future. As a result, the proposed Implementation Agreement, which specifies the terms, conditions, resources, and expectations of the parties to the agreement will cover both listed and unlisted species.

HCP Plan Area: The subject ownership under the HCP covers DNR-managed trust lands comprising approximately 1,630,000 acres, of which all but 50,000 acres are forested. These lands range from scattered isolated parcels under 40 acres to large contiguous blocks in excess of 110,000 acres. The majority of the forest on these lands is conifer. Less than 10 percent is hardwood. Most DNR-managed lands have been logged at least once in the last 100 years. To tailor the minimization and mitigation more closely to particular natural systems and geographic variations in habitat, the area covered by the HCP is divided into nine planning units based on watersheds. There are three units east of the Cascade Mountain Range crest, and the Olympic Experimental State Forest (OESF) along with five units west of the Cascade Mountain Range crest. Planning units are delineated by clustering Water Resource Inventory Areas (WRIA) as defined by the Washington State Department of Ecology that drain to common water bodies.

The east-side planning area encompasses 228,000 acres, the west-side planning area 1,388,000 acres, and the OESF 264,000. The east-side, west-side, and OESF are treated differently in the HCP in terms of conservation strategies, mitigation, and coverage for anadromous salmonids, and will be discussed accordingly.

Summary of HCP Actions: DNR's proposed HCP, which is incorporated herein by reference, provides mitigation and minimization measures associated with an incidental take permit for nine federally listed species, including the northern spotted owl and the marbled murrelet. This mitigation includes providing habitat for the listed birds, as well as managing so as to minimize take of the other seven listed species within the range of the spotted owl. The proposed HCP also conserves habitat for a multitude of unlisted species west of the crest of the Cascade Range. The measures described in the HCP include addressing habitat requirements and minimizing, mitigating and monitoring the impacts of timber and non-timber activities on western Washington

runs of anadromous salmonids and other species west of the Cascade crest that are candidates for listing by the federal government. The HCP proposes to apply a riparian conservation strategy to the five west-side planning units. This strategy proposes to maintain or restore salmonid habitat and to contribute to the conservation of other riparian and riparian-obligate species. In the OESF, the riparian strategy sets objectives to protect and aid restoration of functional species habitat, rather than prescriptions for forest practices within proposed riparian-buffer areas. These strategies are fully described in Section IV of the HCP (DNR(a), 1996). There is no riparian strategy proposed for the eastside planning units since DNR does not propose to address eastside anadromous fish species under this HCP. Consequently, NMFS is not covering the eastside planning units in the HCP nor in this conference report.

III. BIOLOGICAL INFORMATION ON ANADROMOUS FISH SPECIES COVERED UNDER THE HCP

The DNR has proposed that sockeye salmon (*Oncorhynchus nerka*), pink salmon (*O. gorbuscha*), chum salmon (*O. keta*), chinook salmon (*O. tshawytscha*), coho salmon (*O. kisutch*), steelhead trout (*O. mykiss*), and sea-run cutthroat trout (*O. clarki*) for coverage under this HCP. There are 387 distinct salmonid stocks in the westside planning units as defined by SASSI (except sea run cutthroat trout, which were not part of the SASSI analysis) (Washington Department of Fisheries (WDF) et al. 1993). For those 277 stocks for which a status could be determined (WDF et al. 1993), 32 percent were depressed and 4 percent were critical. Nehlsen et al. (1991) rated 40 stocks as having a high risk of extinction and 12 as having a moderate risk. Detailed information of the stock status of individual species can be found in Section III of the HCP.

There are 29 distinct salmonid stocks in the eastside planning units as defined by SASSI (WDF et al. 1993). The majority of these 29 stocks were depressed (21), a minority being healthy (6), and two were not determined.

Sockeye, pink, chum, chinook, and coho salmon and steelhead and sea-run cutthroat trout which all occur in the HCP plan area each have unique geographical distributions, life cycles, and habitat requirements:

Sockeye Salmon - Distributed along the North American coast from the Columbia River to Bristol Bay, Alaska, sockeye salmon spawn in rivers normally associated with lakes. A total of nine spawning stocks have been identified in Washington State (WDF et al. 1993); seven stocks utilize the rivers and lakes west of the Cascade mountain range, and two stocks spawn in the Upper Columbia river region. Distribution and stock status of sockeye salmon within the HCP planning units is detailed in the HCP (DNR(a)1996).

Some sockeye spawn quite close to the sea, although most make long migrations upstream to and through inland lakes (Hart 1973). An example of the sockeye life cycle which may be influenced by forest practices on DNR lands is the Snake River run. Snake River sockeye which must migrate up the Columbia River to spawn at Redfish Lake, Idaho, enter the Columbia River

primarily during June and July. Spawning occurs primarily in October (Bjornn et al. 1968). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for three to five weeks, emerge in April through May and move immediately into Redfish Lake; there juveniles feed on plankton for one to three years before they migrate to the ocean (Bell 1986). Migrants leave Redfish Lake from late April through May (Bjornn et al. 1968), and smolts migrate almost 900 miles to the Pacific Ocean.

Pink Salmon - Thirteen spawning populations of pink salmon have been identified in Washington State (WDF et al. 1993). For twelve of these populations, spawning occurs only in odd years. The sole even-year population exists in the Snohomish River in Puget Sound. Four of the odd-year populations occur in the Nooksack, Skagit, Stillaguamish, and Snohomish Rivers in north Puget Sound, where most pink salmon are produced in Washington. Two odd-year populations occur in Hood Canal in the Hamma Hamma, Duckabush, and Dosewallips Rivers. Three odd-year populations have been identified by WDF et al. (1993) on the Strait of Juan de Fuca: upper Dungeness, lower Dungeness, and Elwha Rivers. Spawning populations do not occur regularly south of northwestern Washington. Distribution and stock status of pink salmon within the HCP planning units is detailed in the HCP (DNR 1996a).

Pink salmon spawn in both large and small rivers in the late summer and fall in clean, coarse gravel in shallow (10-100 cm) pools and riffles exposed to moderately fast (30-150 cm/s) currents. These fish generally avoid spawning in deep, slow-moving water or on muddy, sandy, or heavily silted substrate (Heard 1991). Water temperatures during peak spawning activity range from about 5-15 degrees C and are generally higher in more southern populations. This species tends to spawn closer to tidewater than other species of Pacific salmon, generally within 50 km of the river mouth (Heard 1991, WDF et al. 1993). Upon emerging from the gravel, pink salmon migrate rapidly downstream and spend a few weeks to a few months in estuaries and nearshore marine habitats. From there they migrate to sea for 12-16 months (Heard 1991).

Chum Salmon - Seventy-one spawning populations of chum salmon have been identified in Washington State, occurring all on the west side of the Cascade mountain range (WDF et al. 1993). Distribution and stock status of chum salmon within the HCP planning units is detailed in the HCP (DNR 1996a).

Adult chum salmon spend little time in nearshore coastal waters before they begin their upstream migration to the spawning grounds (Hale 1981). Upstream migration occurs at temperatures between 8.3-21.1 degrees C, although migration at the upper extreme may be delayed (Bell 1990; Salo 1991; Meehan and Bjornn 1991). Chum salmon usually leave marine waters in summer and late fall to begin their upstream migration. Most chum salmon spawn in the lower reaches of streams of various sizes, often just above the tidal zone (Pauley et al. 1988). Spawning occurs in water temperatures ranging from 7.2-12.7 degrees C (Reiser and Bjornn 1979). Eggs are deposited in clean, loose gravels (Reiser and Bjornn 1979). One of the greatest threats to eggs and embryos is streamflow fluctuation (Bell 1990; Salo 1991; Reiser and Bjornn 1979; Nickelson et al. 1992a).

Chum salmon egg survival is thought to be best at 4.4-14 degrees C (Koski 1975; Reiser and Bjornn 1979; Schroder 1973). Chum salmon fry migrate to estuarine areas within a few days to several weeks from emergence during April and May. Migrating juveniles prefer water temperatures of 10 degrees C, although migration occurs between 6.2-13.3 degrees C. Juveniles are attracted to shaded, dark areas (Bell 1990; Salo 1991; Meehan and Bjornn 1991) and linger in estuarine areas until migrating to sea.

Chinook salmon - There are 65 spawning populations of spring, summer, and fall run chinook salmon in Washington, which utilize rivers and streams on both sides of the Cascade mountain range. Distribution and stock status of chinook salmon within the HCP planning units is detailed in the HCP (DNR 1996a).

Most spring/summer chinook salmon enter individual subbasins from May through September. Chinook salmon generally spawn in larger rivers from immediately above the tidal limit upstream as much as 600 miles (Hart 1973). Juvenile spring/summer chinook salmon emerge from spawning gravels from February through June (Perry and Bjornn 1991). Typically, after rearing in their nursery streams for about one year, smolts begin migrating seaward in April and May (Bugert et al. 1990; Cannamela 1992). Spring/summer chinook salmon probably inhabit nearshore areas before beginning their northeast Pacific Ocean migration, which lasts two to three years.

Fall chinook salmon migrate into freshwater from August through October. Fall chinook salmon generally spawn from October through November and fry emerge from March through April. Downstream migration generally begins within several weeks of emergence (Becker 1970, Allen and Meekin 1973), and juveniles rear in backwaters and shallow water areas through mid-summer prior to smolting and migration to the ocean. There, they will spend one to four years before beginning their spawning migration.

Coho Salmon - There are 90 spawning populations of coho salmon in Washington, which utilize rivers and streams mainly on the westside of the Cascade mountain range. Distribution and stock status of coho salmon within the HCP planning units is detailed in the HCP (DNR 1996).

In contrast to the life history patterns of other anadromous salmonids, coho salmon generally exhibit a relatively simple three-year life cycle. Most coho salmon enter rivers from late September to mid-October. Peak spawning occurs anywhere from mid-November to early February. Coho generally spawn at water temperatures within the range of 10-12.8 degrees C (Bell 1991). Nickelson et al. (1992b) found that spawning occurs in tributary streams with a gradient of 3% or less. Spawning occurs in clean, pea-size to orange-size gravel (Nickelson et al. 1992b). Spawning is concentrated in riffles or in gravel deposits at the downstream end of pools featuring suitable water depth and velocity (Weitkamp et al. 1995). Favorable egg incubation range is 10-12.8 degrees C (Bell 1986). Eggs incubate for approximately 35 to 50 days, depending on water temperature, and begin emerging from the gravel two to three weeks after hatching (Nickelson et al. 1992b).

Following emergence, fry move into shallow areas near the stream banks. Juvenile rearing usually occurs in tributary streams with a gradient of 3% or less, although they may move up to streams of up to 20% gradient. Fry may migrate upstream to reach lakes or other rearing areas (Godfrey 1965; Nickelson et al. 1992b). Rearing requires temperatures of 20 degrees C or less, preferably 11.7-14.4 degrees C (Bell 1991; Reeves et al. 1987; Reiser and Bjornn 1979). Coho salmon fry utilize backwater pools, and off-channel pools, beaver ponds, alcoves, and debris-dammed pools with complex cover (Nickelson et al. 1992a, 1992b). Juveniles rear in freshwater for up to 15 months, then migrate to sea as smolts between February and June (Weitkamp et al. 1995).

Steelhead Trout - There are 141 spawning populations of steelhead trout in Washington, which utilize rivers and streams on both sides of the Cascade mountain range. The most widespread run type of steelhead is the winter (ocean-maturing) steelhead. Winter steelhead occur in essentially all coastal rivers of Washington (Busby, et al. 1996). Summer (stream-maturing) steelhead, are less common, with the exception of the Columbia River Basin, where steelhead are essentially all stream-maturing (Busby, et al. 1996). Distribution and stock status of steelhead trout within the HCP planning units is detailed in the HCP (USDC, USDI and DNR 1996a).

Steelhead exhibit perhaps the most complex suite of life history traits of any species of Pacific salmonid. They can be anadromous or freshwater resident (and under some circumstances, apparently yield offspring of the opposite form) (Busby, et al. 1996). Resident forms are usually called rainbow trout. Those that are anadromous can spend up to seven years in freshwater prior to smoltification, and then spend up to three years in saltwater prior to first spawning.

While most species of salmonids die after spawning, steelhead trout may spawn more than once. Most spawning in Washington streams typically stretches from December through June. Adult steelhead spawn in gravel in both mainstem rivers and tributaries (Hart 1973). Steelhead eggs may incubate in stream gravel for 1.5 to 4 months (depending on water temperature) before hatching. Following emergence from the gravel, juveniles rear in freshwater from one to four years (usually two years), then migrate to the ocean. In the marine environment they typically rear for 1 to 3 years prior to returning to their natal stream to spawn primarily as three- four-year-olds (Busby, et al. 1996).

Sea-run Cutthroat Trout - Sea-run cutthroat trout occur in most western Washington lakes, rivers and streams (USDC, USDI, and DNR 1996a). Unlike other anadromous salmonids, anadromous cutthroat trout do not over-winter in the ocean and only rarely make long extended migrations across large bodies of water. They migrate in the nearshore marine habitat and usually remain within 10 km of land (Sumner 1972, Giger 1972, Jones 1976, Johnston 1981). While most anadromous cutthroat trout enter seawater as 2- or 3-year-old fish, some may remain in fresh water for up to 5 years before entering the ocean (Sumner 1972, Giger 1972).

Cutthroat trout have been documented to spawn each year for at least 5 years (Giger 1972). Cutthroat usually spawn and rear in small remote headwater tributaries, where competition with other salmon species is minimized (Glova 1978). Eggs begin to hatch within 6-7 weeks of

spawning, depending on temperature. Alevins remain in the redds for a few weeks after hatching, then emerge as fry between March and June (Giger 1972, Scott and Crossman 1973). Fry prefer low velocity margins, backwaters, and side channels, gradually moving into pools if competing species (i.e. coho) are absent. In winter, cutthroat trout go to pools near log jams or overhanging banks (Bustard and Narver 1975).

The following is the status of NMFS' actions on each anadromous salmonid species occurring in the HCP Plan area. Table 1 depicts the ESUs which have been defined by NMFS for coho salmon, pink salmon, and steelhead trout with respect to the DNR planning units.

Table 1. Salmonid species by ESU with respect to the DNR planning units. ESUs in **bold** are proposed as Candidate species, *italics* as Threatened species, and ***bold italics*** as Endangered species under the ESA.

	DNR PLANNING UNIT								
	OESF	South Coast	Straits	North Puget	South Puget	Columbia	Klickitat	Yakima	Chelan
Coho	Olympic Peninsula	L. Col. River/ SW Wash	Puget Sound/ Strait of Georgia	Puget Sound/ Strait of Georgia	Puget Sound/ Strait of Georgia	L. Col. River/ SW Wash	L. Col. River/ SW Wash		
Pink			Elwha Dungnss	Nooksack Skagit Stillgmsh Snhmsh	Lk Wash So.PS/ Hood Canal				
Steel-head	Olympic Peninsula	SW Wash.	Puget Sound	Puget Sound	Puget Sound	<i>L. Col. River</i>	<i>L. Col. River</i>	Mid. Col. River	Mid/ Uppr. Col. River

Coho Salmon

During this century, indigenous, naturally-reproducing populations of coho salmon are believed to have been extirpated in nearly all Columbia River tributaries and to be in decline in numerous coastal streams in Washington (July 25, 1995 60 FR 38011). In general, there is a geographic trend in the status of West Coast coho salmon stocks, with the southernmost and eastern most stocks in the worst condition. Currently, coho salmon have been separated into three Evolutionary Significant Units (ESUs) in Washington State, identified as Lower Columbia River/southwest Washington Coast, Olympic Peninsula, and Puget Sound/Strait of Georgia. At the time of proposed coast-wide listings for coho, NMFS commented on all three ESUs (July 25, 1995, 60 FR 38011) as follows:

Olympic Peninsula - moderate, but stable. NMFS believes that there is substantial native, natural production of coho salmon and that it is not threatened or endangered at this time.

Lower Columbia River/southwest Washington Coast - listing is not warranted. However, there is sufficient concern regarding the overall health of this ESU (especially in light of evidence that some native, naturally-reproducing fish may exist). NMFS is adding this ESU to the Candidate List until the distribution and status of the native populations can be resolved.

Puget Sound/Strait of Georgia - listing is not warranted. However, sufficient concern regarding the overall health of this ESU warrants adding it to the Candidate List. A thorough reevaluation of the status of this ESU will reconsider the present decision that a listing is not warranted.

Chinook Salmon

Fall, spring, and summer chinook salmon in the Snake River have been listed as threatened under the Endangered Species Act since April 22, 1992. West Coast Chinook Salmon are currently under evaluation by a biological review team assembled by NMFS to determine if they warrant protective status under the Endangered Species Act. This status review is due to be completed in 1997.

Sockeye Salmon

S Snake River sockeye salmon have been listed under the Endangered Species Act as endangered since November 20, 1991. West Coast Sockeye Salmon are currently under evaluation by a biological review team assembled by NMFS to determine if they warrant protective status under the Endangered Species Act. This status review is due to be completed in 1997.

Chum Salmon

West Coast chum salmon are currently under evaluation by a biological review team assembled by NMFS to determine if they warrant protective status under the Endangered Species Act. This status review is due to be completed in 1997.

Pink Salmon

A determination published on October 4, 1995 found that no listings are warranted for either of the odd-year or even-year northwest stocks.

Steelhead Trout

Historically, steelhead were distributed throughout the North Pacific Ocean from Russia to the northern Baja Peninsula. Steelhead likely inhabited most coastal streams in Washington, Oregon, and California as well as many inland streams in these states and Idaho. However, during this century, more than 23 indigenous, naturally-reproducing steelhead stocks are believed to have been extirpated and many more are in decline in numerous coastal and inland streams in Washington, Oregon, Idaho, and California.

NMFS has completed a comprehensive status review of West Coast steelhead populations in Washington, Oregon, Idaho, and California, and has identified 15 ESUs within this range. At the time of proposed coast-wide listings for steelhead, NMFS commented on all three ESUs (August 9, 1995, 61 FR 41541) as follows:

Puget Sound - not presently in danger of extinction, nor is it likely to become endangered in the foreseeable future. Presently, listing is not warranted, however, NMFS has several concerns about the overall health of this ESU and about the status of certain stocks within the ESU.

Olympic Peninsula - not presently in danger of extinction, nor is it likely to become endangered in the foreseeable future. Presently, listing is not warranted, however, NMFS has several concerns about the overall health of this ESU and about the status of certain stocks within the ESU.

Southwest Washington - not presently in danger of extinction, nor is it likely to become endangered in the foreseeable future. Presently, listing is not warranted.

Lower Columbia River - not presently in danger of extinction, but is likely to become endangered in the foreseeable future.

Middle Columbia Basin - not presently in danger of extinction, but NMFS has reached no conclusion regarding its likelihood of becoming endangered in the foreseeable future. This ESU is considered a Candidate for listing.

Upper Columbia Basin - is presently in danger of extinction.

Sea-Run Cutthroat Trout

West Coast sea-run cutthroat trout are currently under evaluation by a biological review team assembled by NMFS to determine if they warrant protective status under the Endangered Species Act.

From the perspective of forest land management, the similarities among the anadromous salmonid species outweigh the differences. Anadromous fish spend part of their life at sea and return to freshwater to reproduce. During the portion of their life cycle spent in rivers and streams, these fish are vulnerable to forest practices that affect the integrity of riparian ecosystems (Hicks et al. 1991). There are few significant differences in the ways that forest practices impact each species. Therefore, distinctions among the life cycles of these species were not emphasized in the HCP, although time of return, spawning season, area of juvenile development, and time in freshwater were detailed for each species in Section III of the HCP (DNR, 1996a).

It is common to all salmonids to require moderate stream flows; cool, well-oxygenated, unpolluted water; low suspended-sediment load; adequate food supply; and structural diversity provided by submerged large woody debris (Cederholm 1994). Well-functioning riparian ecosystems are necessary to satisfy these habitat needs. A detailed description of the direct and upland influences of forest operations on salmonid habitat is covered in Section III of the HCP (DNR, 1996a).

Anadromous salmonids occupy all of Washington and occur throughout the waters in the five westside and three eastside planning units, and the OESF except the area north of the Snake River drainage and east of the Columbia River in central Washington and the area east of the Okanogan Highlands in northeastern Washington (WDF et al. 1993). Over 80 percent of DNR-managed lands west of the Cascade crest in the area covered by the riparian conservation strategy under this HCP are in watersheds that contain only coho, chinook, and steelhead. Smaller percentages of DNR-managed lands are in Watershed Administrative Units (WAU) that also contain chum, sockeye, and pink salmon and sea-run cutthroat trout. All DNR-managed lands in the Olympic Experimental State Forest are in WAUs that contain coho and steelhead. Anadromous salmonids inhabit more than 1,000 miles of streams on DNR-managed forest land and the OESF.

Critical Habitat Presently, anadromous salmonids covered by this HCP are not listed under the ESA, although two steelhead ESUs are proposed for listing. Critical habitat has not been designated or proposed as of this writing. However this analysis will describe potential critical habitat elements (e.g. key features of properly functioning riparian and aquatic systems) and show how they are addressed by the HCP.

IV. ENVIRONMENTAL BASELINE

The environmental baseline for the anadromous salmonid species that inhabit the area covered by the HCP, includes the past and present effects of all Federal, State, or private activities in the action area, the anticipated effects of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the effect of State or private actions which are contemporaneous with the consultation in progress (50 C.F.R. 402.02). As stated earlier, all anadromous salmonid species analyzed herein are presently unlisted, so there have not yet been section 7 consultations on these species within the 1.6 million acre HCP area. This analysis will focus on the past and present effects of all Federal, State, or private activities in the HCP area.

The large reduction of productivity of the Pacific Northwest salmon stocks as compared to records taken from 1864 to 1922 (Wilderness Society 1993) has been attributed to many factors, including large-scale water projects (dams), poor fisheries management (overfishing and hatchery practices), urbanization, agriculture, and detrimental forest practices (Palmisano et al. 1993; Nehlsen et al. 1991). Although significant factors both inside and outside the HCP areas impact anadromous salmonids, once they reach their natural spawning and rearing areas within the HCP area, they are subject to the existing habitat conditions of the ownership.

Although there was no information presented in the HCP on specific studies of the effects of historic logging practices on, or the present conditions of riparian and salmonid habitat in the Plan Area, the types and extent of likely effects have been well documented for similar landscapes that were logged in the same period (Murphy 1995). Channels were simplified by channelized landslides and splash damming that removed in-stream structure and pools. Fish passage was inadvertently blocked in some streams by road and railroad fills. Riparian trees that would have contributed shade, bank stability, and a steady supply of large woody debris (LWD) to streams were largely removed by extensive logging in the riparian zone.

Thus, for the purposes of this analysis, riparian and aquatic habitats under the environmental baseline will be assumed to be at risk or not properly functioning.

Washington Coast

Along the Washington Coast, which encompasses the OESF and South Coast planning units, all basins are affected (to varying degrees) by habitat degradation. Tributaries inside Olympic National Park are in the best condition. For other areas, major habitat problems are primarily related to forest practices, including mass wasting resulting in sedimentation in spawning grounds, lack of large woody debris, and lack of streamside shade. For example, WDF et al. (1993) reported that the Hoko River has been heavily impacted by past logging practices, with over 300 mass-wasting events recorded in the last 50 years. Clearing of instream wood was common practice until the 1970s, resulting in channel downcutting and bedload scour and fill which, in combination with moderate to high levels of fine sediments in gravel beds, affects egg survival in

many areas. Bishop and Morgan (1996) identified a variety of critical habitat issues for streams in the range of the Washington Coast, including changes in flow regime, sedimentation, high temperatures, streambed instability, estuarine loss, loss of large woody debris, and loss of pool habitat.

Coho, chinook and steelhead hatchery strays have made a significant contribution to naturally spawning populations in the Satsop and Willapa Bay Rivers (Marshall et al. 1995), and Sol Duc River (WDF et al. 1993).

Puget Sound

Habitat in the Puget Sound region, which encompass the **Straits, South Puget, and North Puget** planning units, has been blocked off from fish passage or degraded. In general, upper tributaries have been impacted by forest practices and lower tributaries and mainstem rivers have been impacted by agriculture and/or urbanization. Diking for flood control, draining and filling of freshwater and estuarine wetlands, and sedimentation due to forest practices and urban development are cited as problems throughout this region (WDF et al. 1993). Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood control projects are major habitat problems in several basins. Bishop and Morgan (1996) identified a variety of critical habitat issues for streams in this region, including changes in flow regime, sedimentation, high temperatures, streambed instability, estuarine loss, loss of large woody debris, loss of pool habitat, and blockage or passage problems associated with dams or other structures.

Hatchery effects are demonstrated by the fact that nearly 2 billion chinook salmon have been released into Puget Sound tributaries since the 1950s. The electrophoretic similarity between Green River fall-chinook salmon and other fall chinook salmon stocks in Puget Sound (Marshall et al. 1995) suggests a significant effect from these hatchery transplants. Artificial propagation of coho in the Puget Sound region has caused adverse effects on natural populations (NMFS 1995). Hatchery steelhead in this region are also widespread, spawn naturally, and are largely derived from a single stock (Chambers Creek) (NMFS 1996).

Columbia River

In the lower, middle, and upper Columbia River region, which includes a portion of the **South Coast, Columbia, Klickitat, Yakima, and Chelan** planning units, anadromous fish have been strongly affected by losses and alterations of freshwater habitats. Bottom et al. (1985), WDF et al. (1993), and Kostow (1995) provide reviews of habitat problems in this region. In general, timber harvesting and associated road building occur throughout the region on federal, state and private lands. Agriculture is also widespread in lower portions of river basins, and has resulted in widespread removal of riparian vegetation, rerouting of streams, degradation of streambanks, and summer water withdrawals (Kostow 1995).

Hatchery programs to enhance coho, chinook and steelhead fisheries in the lower Columbia River began in the 1870s, and have continued throughout this century. Available evidence indicates a pervasive influence of hatchery fish on natural populations throughout this region (Howell et al. 1985, Marshall et al. 1995).

The percent of the total land area west of the Cascade crest that effects salmonids and is managed by DNR was estimated as 11 percent in the five westside planning units, and 26 percent in the OESF. There were no similar estimates given in the HCP for the eastside planning units.

V. ELEMENTS OF THE HABITAT CONSERVATION PLAN

DNR's general conservation objectives for the riparian conservation strategy for the westside planning units and OESF are to provide resource protection and natural restoration with a long-term effort to find management and conservation solutions through experimentation and active resource management (DNR 1996). Specific riparian protection relies on watershed-level assessments of physical and biological conditions of riparian forests for determining the level of protection over long term. Interim management strategies and buffer-width guidelines are provided while assessments are being completed. These strategies remain in effect through interim phase landscape planning and implementation of landscape plans.

Riparian conservation strategies shall be implemented in the five west-side planning units and the Olympic Experimental State Forest (OESF) as part of DNR's minimization and mitigation measures for anadromous salmonids in the HCP. The strategies are different in the OESF because:

- (1) of the research emphasis in the OESF, and
- (2) the climatic, geological, and physiographic characteristics of the western Olympic Peninsula present special problems for forest management around riparian areas which warrant different treatments.

In addition to the HCP prescriptions, DNR will continue to participate in watershed analysis according to state Forest Practices Rules (Washington Forest Practices Board 1994). If watershed analysis indicates that public resources require a greater level of protection than that specified by the HCP, the prescriptions developed through watershed analysis to provide this additional protection shall be implemented.

DNR's conservation objective for the northern spotted owl is to provide habitat that makes a significant contribution to demographic support, maintenance of a species distribution, and facilitation of dispersal. Due to differences in the habitat ecology of the spotted owl in western and eastern Washington, two different conservation strategies are used. The primary difference as it relates to potential effects to anadromous fish is the active forest management within spotted

owl nesting, roosting, and foraging (NRF) habitat in the eastside planning units. These practices are explained in detail in the HCP (DNR, 1996a). Below are a few of the highlights that are important in the analysis of potential effects to anadromous fish habitat:

The HCP supports spotted owl populations near federal reserves with NRF habitat and dispersal habitat developed and maintained on at least 50 percent of DNR-managed acreage in designated areas. Within the designated areas, NRF habitat and dispersal habitat for owls are allowed to move over time as other sites reach target conditions. Forest management activities within dispersal habitat and within NRF habitat are permitted.

Depending on the habitat conditions that exist at the time a WAU is entered for timber management, one of four possible scenarios would apply:

- (a) If the amount of existing NRF habitat in a WAU is equal to or greater than 50% of the total area of federal reserved plus DNR-designated NRF areas, then DNR will maintain 50% of its designated NRF lands in the WAU as NRF habitat.
- (b) If DNR-designated NRF areas by themselves contain less than 50% habitat, DNR will develop new habitat up to 50% of the area of those lands, regardless of the amount of current habitat on federal reserves plus DNR-designated NRF areas in the WAU.
- (c) If the amount of current habitat in the WAU is less than 50% of the total area of federal reserves plus DNR-designated NRF areas, and DNR-designated NRF areas by themselves contain greater than 50% habitat, DNR will maintain an amount of habitat that is equal to the current amount.
- (d) If there are no federal reserves in a WAU in which DNR-designated NRF areas occur, DNR will maintain 50% of its lands designated as NRF management areas in NRF habitat.

Under a,b, and d, harvest of habitat can take place in WAU's where there is greater than 50% habitat on DNR-managed lands in designated NRF areas. Harvesting shall be designed to leave a specified level of nesting structure in the landscape.

A. PROPOSED CONSERVATION MEASURES TO AVOID, MINIMIZE AND MITIGATE TAKE

(1) Westside Planning Units

1. DNR will use riparian buffers (RMZ) on both sides of Types 1,2,3, and 4 waters to address riparian functions that influence the quality of salmonid freshwater habitat, including bank stability, stream shading, sediment load, detrital nutrient load, and the delivery of large woody debris. The RMZ consists of an inner riparian buffer (minimum 100' or site potential tree height, whichever is greater on Type 1,2, and 3 waters; 100' on Type 4 waters) and an outer wind buffer

(100' on Type 1 and 2 waters; 50' on Type 3 waters >5' wide) where needed to protect the inner buffer. For the purposes of this HCP, the height shall be derived from standard site index tables (King 1966), using 100 years as the age of a mature conifer stand. When determining the width of the buffer, the site productivity used in the derivation will be that occurring in upland portions of the riparian ecosystem for that particular site. The site index table used will be that corresponding to the dominant conifer species occurring in the upland portion of the riparian ecosystem. This prescription should result in average buffer widths between 150 and 160 feet (DNR 1996).

RMZs are measured as the horizontal distance from the 100 year floodplain. The 100-year floodplain is the valley-bottom area adjoining the stream channel that is constructed by the stream under the present climatic regime and overflowed at times of very high discharge (i.e. flooding associated with storms of a 100-year recurrence interval; Dunne and Leopold 1987).

No harvest will be allowed in the first 25', "minimal harvest" in the next 75', and "low harvest" will be allowed in the remaining buffer more than 100' from the active channel margin. These prescriptions and accompanying rationale are described in Chapter IV of the HCP (DNR, 1996a; USDC, USDI and DNR, 1996b). The DNR and the Services will develop specific procedures for managing riparian areas after the HCP and IA have been finalized through formation of an interagency science team. The NMFS will use the matrix of pathways and indicators (NMFS, 1996) as a tool to assist in the development of the riparian management strategy.

Timber harvesting conducted within the riparian management zones and wind buffers prior to agreement on the proposed agency procedures will be subject to the following limitations:

- a. Within the 25 foot "no harvest" zone, only commonly accepted restoration activities may occur; and
- b. Within the "minimal harvest zone", "low harvest zone", and "wind buffer", partial harvests may occur that remove no more than 10% of the conifer volume and/or 20% of the hardwood volume per rotation.

DNR may slightly increase timber harvest within the RMZ and wind buffers with the limits described in Section 4 of the HCP if agreement has not been reached between the agencies within three months of the Services receiving the proposed procedures.

Stream Types 1 through 5 are those defined by the Washington Forest Practice Act (RCW 76.09) under WAC 222-16-030. It has been demonstrated that Stream Type classifications error is quite high (Bahls and Ereth 1994). DNR recognizes that the incorrect classification of streams as Type 4 or Type 5 (non-fish bearing) waters could result in a significant adverse effect to salmonid habitat. In order to avoid such effects, a riparian buffer of 100 feet wide was applied to both sides of Type 4 waters (USDC, USDI and DNR 1996b). Additionally, stream typing will be examined or verified in the field prior to harvest.

2. DNR's Road Management Strategy will be implemented to: 1) minimize further road related degradation of riparian, aquatic, and identified species habitat; 2) plan, design, construct, use and maintain a road system that serves DNR's management needs; and 3) remove unnecessary road segments from the road network. This strategy is detailed in Section IV of the HCP (DNR 1996). Comprehensive road maintenance plans will include annual inventories of road conditions, aggressive maintenance, stabilization, and access control to minimize management and environmental problems, and control of expansion of road network densities. Standards will be consistently applied and updated for quality new road construction and appropriate placement based on current and new knowledge and technology (DNR 1996). DNR will initially focus on improvements in the more sensitive areas of a landscape with priority given to locations on steep slopes with unstable soils and high precipitation, and locations within 100 feet of Type 1,2, and 3 waters and wetlands. In order to minimize increases in road densities, log yarding through the harvest zone in the RMZ will be allowed. Specific prescriptions for this yarding, and any other management within the RMZs, will be developed by DNR and reviewed by the Services, and would be based on detailed, site-specific conservation objectives, with sufficient monitoring to ensure that RMZ management will adequately provide the desired characteristics of riparian function.

3. With respect to Type 5 water protection: (1) those streams crossing unstable portions of hillslopes will be protected (no timber harvest) to minimize potential for landslides and other mass-wasting activities; (2) those streams crossing stable ground will be protected, where necessary for maintaining important elements of the aquatic ecosystem; and (3) an aggressive, 10-year research program will be established to study the effects of forest management along Type 5 waters on aquatic resources. At the end of 10 years, a long-term conservation strategy for forest management along Type 5 waters shall be developed and incorporated into the HCP.

4. Potential introductions of sediments from management will be minimized by placing harvest restrictions near Type 5 waters flowing through unstable slopes and high risk of mass wasting, and through the development and implementation of a comprehensive landscaped-based road network, which includes identification of fish blockages caused by stream crossings and a prioritization of their retrofitting or removal.

5. Adverse effects to salmonid habitat caused by rain-on-snow floods will be minimized by maintaining two-thirds of DNR-managed forest lands in drainage basins in forest that is hydrologically mature with respect to rain-on-snow events. In addition, improved management of road systems will be expected to result in less adverse effects on natural hydrologic function.

6. DNR will monitor the HCP to 1) determine whether the HCP conservation strategies are implemented as written; and 2) determine whether implementation of the conservation strategies results in anticipated habitat conditions. Implementation monitoring will document the types, amounts, and locations of forest management activities carried out on DNR-managed lands in the five westside and OESF HCP planning units, both inside and outside areas addressed by the

conservation strategies. Research monitoring in riparian habitats will focus on determining how to design wind buffers, evaluation of forest practices along Type 5 waters not associated with unstable slopes, how to harvest timber within riparian buffers and in mass wasting areas, and to develop basic information on the relationship between forest practices and riparian ecosystems, and basin hydrology.

Monitoring reports will be completed and submitted to the NMFS and the USFWS by March 30 of each year. Details of this monitoring program appear in Chapter V of the HCP. Details of the monitoring plan will be developed by the interagency science team.

(2) Olympic Experimental State Forest (OESF)

DNR's conservation objectives for the riparian conservation strategy in the OESF takes on a landscape approach to the protection and restoration of the aquatic, riparian, and associated wetland system and maintaining and restoring those factors which affect this system. These factors include the physical integrity of stream channels and floodplains; the natural disturbance regime of the system; sediment regime; and the development of information materials about this dynamic system and its maintenance and restoration in commercial forests. Specifically, the riparian conservation strategy in the OESF seeks to meet the following objectives:

1. maintain and aid restoration of the composition, structure, and function of aquatic, riparian, and associated wetland systems which support aquatic species, populations, and communities;
2. maintain and aid restoration of the physical integrity of stream channels and floodplains;
3. maintain and aid restoration of water to the quantity, quality, and timing with which these stream systems evolved (i.e. the natural disturbance regime of these systems);
4. maintain and aid restoration of the sediment regime in which these systems evolved, and
5. develop, use, and distribute information about aquatic, riparian, and associated wetland-ecosystem processes and on their maintenance and restoration in commercial forests.

To help meet these objectives, DNR will provide the following protective mechanisms concerning riparian habitats:

1. DNR will use interior-core buffers intended to minimize disturbance of unstable channel banks and adjacent hillslopes to protect and aid natural restoration of riparian processes and functions. Harvesting can occur within the buffers as long as the activities are consistent with the conservation objectives. While buffer widths will be determined on a site specific basis, based on landscape level field evaluations, the average widths for Type 1 and 2 waters is 150', Type 3 and 4

waters 100', and Type 5 waters will be buffered following a 12-step watershed-assessment procedure described in the HCP. Buffer widths are measured horizontally, outward from the channel migration zone (e.g. 100 year floodplain).

2. DNR will use exterior buffers intended to protect the integrity of interior-core buffers from winds. Exterior buffers will also help maintain channel-floodplain interactions, moderate riparian microclimate, shield the inner core from the physical and ecological disturbances of forest practices on upslope sites, and maintain diverse habitat for riparian-dependent species. The average width of the exterior buffers on Type 1,2, and 3 waters is 150', and Type 4 and 5 waters 50'. DNR anticipates that exterior buffers will be applied on approximately 75% to 85% of the riparian areas in the OESF.

3. Potential introductions of sediments from management will be minimized by placing harvest restrictions near Type 5 waters flowing through unstable slopes and high risk of mass wasting, and through the development and implementation of a comprehensive landscaped-based road network, which includes minimizing active road density; prioritizing roads for decommissioning, upgrading, and maintaining; and identifying fish blockages caused by stream crossings and prioritizing retrofitting or removal.

4. DNR will initiate a 12-step watershed assessment procedure to insure the objectives of the OESF riparian conservation strategy and timber management objectives will be met. Results from assessments of physical and biological conditions obtained from the regulatory watershed-analysis process (Washington Forest Practices Board 1994) will be used where possible, in lieu of those assessments required in the 12-step process.

(3) Non-Timber Resources

In addition to timber harvest, the DNR markets other non-timber resources that include activities that may affect anadromous salmonids. The activities that have the highest likelihood to affect anadromous salmonids include valuable materials sales, such as sand, gravel, and hard rock mining, oil and gas leases, recreational placer mining, firewood cutting, and road, powerline and pipeline rights-of-way. DNR believes that current 1996 levels of these non-timber activities do not result in take of listed species, or if they do, the levels are de minimis, and there are sufficient state regulations in place that minimize and mitigate for these activities (see Landino, 1996 and 1997). However, the DNR is requesting permit coverage for nontimber activities that occur in timberlands. The DNR is not requesting a permit for nontimber activities that occur outside timberlands, such as instream sand and gravel mining and gold dredging. These activities occur in aquatic lands that include, by definition, both tidal and navigable freshwater submerged lands (stream beds).

Rights-of-Way

Rights-of-way include permitting the use of existing roads, the construction of new roads for access by homeowners and forest landowners, permits to local governments for county and state roads, and permitting powerline and pipeline rights-of-way. Timber harvest usually results from new road construction and creation of powerline/pipeline rights-of-way. Any right-of-way that interferes with a water course important to fish life (including effects from siltation), is subject to the Washington state hydraulic code rules (WAC 220-110) and must obtain a hydraulics permit approval or HPA.

Activities associated with rights-of-way are managed according to policies 25 through 28 of DNR's 1992 Forest Resource Plan (FRP) which are supplemental to state laws and regulations. These policies state that "... the department will consider the effect of the proposed action on trust assets and the environment" and that DNR may also restrict certain road uses by "Cooperating with other public agencies to restrict access to protect sensitive wildlife habitat or to provide quality hunting experience." Most existing rights-of-way are for existing DNR roads that provide access to lands managed by large forest landowners, although some are providing access to homeowners near residential or transition areas (Rick Cooper, DNR, pers., comm., 11-25-96).

All non-federal timber harvest associated with construction of new roads or a right-of-way must have an approved state forest practices application.

Firewood Cutting

DNR is required by RCW 76.20 to offer firewood for free, up to 6 cords per person per year. In most Regions the demand for firewood exceeds supply. The removal of firewood is for personal use only. RCW 76.20.010 indicates green trees can be harvested. It allows the "...removal of standing or down timber which is unfit for any purpose except to be used as firewood". However, the fire wood cutting permit for the SE Region specifically states green timber, and standing dead timber (snags) cannot be felled. This permit condition is standard for all DNR Regions with respect to firewood cutting. State law does not restrict the area of the removal, but the Regions can designate when and where removal can occur.

Valuable Material Sales

Sand and gravel

These sales are handled under contracts. DNR currently has 30-40 such contracts for about 1,000 acres (FEIS, 1996), with 15 to 20 of these in forested areas. The sale of sand or gravel from these contracts is subject to the State Environmental Policy Act (SEPA). SEPA allows state agencies to comment though their comments are not binding on the permit agency, in this case the DNR. The DNR also has a SEPA policy in place that applies to all surface mining, including sand

and gravel. This policy calls for the "...elimination of conditions that will...be hazardous to...fish...". Actual protections in place for sand and gravel mining include NPDES permits administered by the DOE (WAC 173-200), and the Surface Mining Act (RCW 78.44). The DOE issues permits only to those that can meet the state's surface and groundwater standards (WAC 173-201A and 200). The DNR is not seeking coverage for sand and gravel mining in streams at this time. However, sand and gravel mining can occur in floodplains, and DNR is asking for permit coverage for this activity. There are no specific minimization measures for floodplain sand and gravel mining by state law, though DNR can condition the contracts or lease agreements. However, there are no standard mitigation measures for this activity.

Prospecting Leases/Mining Contracts

Mineral prospecting leases are for metallic and industrial nonmetallic minerals. The lease must be converted to a mining contract before mine development or operations commence. There are 13 existing leases in the HCP area. Most of these are 500 to 600 acres each. As above, the DNR is not seeking a permit for instream mining. The Surface Mining Act requires a reclamation plan and a hydrogeologic evaluation for any mining that may occur in floodplains or in river and stream channels. The Metals Mining and Milling Operations Act has a screening process that excludes tailings facilities from 100 year floodplains. Also, heap leach extraction processes are under moratorium in Washington state.

Oil and Gas Leases

There are about 77 leases affecting 20,000 to 25,000 acres, mostly in the Puget Sound lowlands. Only 2 wells have been drilled, (the Twin Rivers well NE of Lake Crescent, and the Hunt well in Morton). The Twin Rivers well was plugged and capped 8 years ago and the Hunt well is still being drilled. There is no oil or gas produced in the state of Washington, and most exploration activity occurred in the past. Substantive protections for streams and salmon are in place, and include no exploration or drilling within 200 ft. of stream types 1-4 (DNR Oil and Gas lease restrictions), as well as the surface and groundwater protections from the NPDES permit process.

Off-road Vehicle Trails (ORV)

The DNR acknowledges ORV trail use occurs illegally on DNR lands, but they do not condone it. DNR is very concerned about damage to aquatic resources caused by this type of recreational activity in high use areas. It has taken, and continues to take, a proactive approach in rehabilitating riparian ORV trails, including revegetation and trail maintenance and education of ORV users for proper ORV trail use and location of these trails.

VI. ANALYSIS OF EFFECTS

A. EVALUATING THE PROPOSED ACTION

The standards for determining jeopardy are set forth in Section 7 (a) (2) of the ESA, and defined in the implementing regulations (50 C.F.R. Section 402). At this time, the NMFS is unable to determine whether actions in this conference are likely to destroy or adversely modify critical habitat. This determination can be made at a later date, when and if critical habitat is designated for anadromous salmonids affected by this HCP. However this analysis will determine to what extent this action will likely affect riparian and aquatic habitats important to anadromous salmonids.

The NMFS jeopardy analysis considers how the proposed action (i.e. the HCP) is expected to directly and indirectly affect specific environmental factors that define properly functioning riparian and aquatic habitats essential for the survival and recovery of the species under consideration. This analysis is set under the dual context of the species biological requirements (Section III above), under the environmental baseline (Section IV above). The analysis takes into consideration the overall balance of protective, restorative and detrimental activities taking place within the HCP area. If the cumulative effects of the action are found to jeopardize the proposed species, then the NMFS must identify any reasonable and prudent alternatives to the proposed action. These alternatives would be enforceable if the currently proposed species are eventually are listed.

B. EFFECTS OF THE PROPOSED ACTION

(1) Westside Planning Units and OESF

All seven species of Pacific salmon (*Oncorhynchus* spp.) are found in western Washington lakes, river, and streams (Wydoski and Whitney 1979) and occur within the HCP area. These fish have become adapted to cool, clean water, with abundant gravels and a diversity of habitats composed of riffles and pools. Because salmon have evolved in a largely forested setting, many of their adaptations are associated with cool water temperatures, high oxygen concentrations, and an abundant supply of large woody debris (LWD).

Salmonids and riparian habitats are impacted by timber harvest operations. Some of the activities that cause these effects include, the removal of riparian trees, the building and use of roads, and the effects of clearcuts and roads on watershed hydrology and potential to cause landslides. The removal of riparian trees reduces stream shading and can increase summer water temperatures, or decrease winter temperatures. Also, the necessary input of LWD as a functional channel forming element and fish habitat feature can be reduced by riparian harvests. Increased road and road use can increase sediment inputs above natural levels and impact salmon spawning gravels, or even

bury eggs and alevins. For a more complete analysis of the effects of timber harvest see the DEIS (DNR, NMFS, FWS, 1995).

The forest management described in the riparian conservation strategy in both the westside planning units and the OESF will result in improved salmonid habitat on DNR-managed lands. The improvement will occur as:

- (1) deciduous and young conifer forests within riparian ecosystems develop into older conifer forests;
- (2) young forests on unstable hillslopes develop greater root strength and reach full hydrologic maturity; and
- (3) the adverse effects of roads are reduced through comprehensive landscape-based road network management.

Under this HCP, the riparian buffers will be managed to: 1) maintain or restore (westside); or 2) to maintain and aid restoration of (OESF), salmonid habitat. The no-harvest and minimal harvest areas of the buffer are anticipated to develop into forest with old-growth characteristics, i.e. large old trees, multilayered canopy, and numerous snags and logs. The low-harvest area is intended to provide significantly more large woody debris than present day conditions will yield. This strategy should lead, over time, to an age-class distribution of increasing amounts of large saw timber within the riparian management zones. Over the life of the HCP, large saw timber is predicted to increase from the current 7-8% to nearly 75% of the composition of timber within the riparian zone throughout DNR's 1.6 million acres. These estimates were extrapolated from Appendix 3 of the Final EIS of the HCP (USDC, USDI and DNR 1996b).

The DNR designed the width of the riparian buffer to maintain the functions of riparian ecosystem processes that influence the quality of freshwater salmonid habitat. Water temperature, stream bank integrity, sediment load, detrital nutrient load, and the delivery of large woody debris were the principal considerations used for designing the riparian buffer widths.

In a managed forest, the amount of large woody debris delivered to a stream from the direct influence zone is principally a function of buffer width and tree heights within the buffer (Van Sickle and Gregory 1990; McDade et al. 1990; Murphy 1995). Field measurements by McDade et al. (1990) indicate that buffer widths equal to approximately 60 percent of the average tree height will provide 90 percent of the natural level of instream large woody debris. Extrapolating from these results, a buffer width equal to approximately the 100-year site potential tree height, which is more than 60 percent of the 200-year site potential tree height (i.e. 60 percent of an old-growth tree height), should provide more than 90 percent of the natural level of instream large woody debris.

In the five west-side planning units, Type 4 and 5 waters make up approximately 90 percent (by length) of the stream network on DNR-managed forest lands. Low-order streams (e.g. DNR type 4 and 5) are the major link between hillslopes and higher order fish-bearing streams (FEMAT 1993). These low-order streams provide water, sediment, nutrients, and wood to downstream fish habitat (Swanston 1991; Richardson 1992; Conners and Naiman 1984; Bilby and Bisson 1992). Riparian management zones along all Type 4 and some Type 5 waters are intended to maintain the physical and biological processes that form this linkage. The 100 foot buffer widths prescribed by the HCP around type 4 waters should be effective in maintaining water temperature (Beschta et al. 1987), intercepting sediments (Lynch et al. 1985; Moring 1982), and providing detritus (Erman et al. 1977 as discussed in FEMAT 1993) necessary for salmonid survival.

Extending the riparian management zone from the waters edge to the 100-year floodplain will protect those anadromous fish species (i.e. coho) which utilize off-channel habitats for rearing.

The purpose of the proposed wind buffer is to increase the stability and longevity of the riparian buffers, and to maintain its ecological integrity. The current wind buffers prescribed by the HCP are temporary until research concerning windthrow in managed forests is complete. These buffers appear to be adequate at least in the short term, based on observations and research by Gratoski (1956) who found that 77 percent of blowdown occurred within 100 feet between the forest and area clearcut. Additionally, Gratoski (1956) observed that the amount of blowdown diminished by one-half for each successive 50 feet from the edge.

Forest Harvest Management activities within the riparian management zone were developed with respect to maintaining a properly functioning riparian and aquatic system. The no-harvest area is intended to maintain stream bank integrity, and the specifications for the minimal harvest area were based on research results and recommendations to maintain water temperature (Beschta et al. 1987), intercepting sediment (Lynch et al. 1985; Moring 1982) and providing detritus (Erman et al. 1977 as discussed in FEMAT 1993).

The HCP allows yarding corridors across stream channels and through the riparian management zones (RMZ). Yarding through the RMZ creates breaks in vegetation and disturbs stream banks. This could lead to short-term increases in water temperature and sediment. Yarding corridors also remove trees that could otherwise contribute future LWD to the stream. However, road construction results in long-term increases in water temperature, sediment, and alteration of basin hydrology. Therefore, in general, yarding logs through riparian areas is less damaging to aquatic resources than new road construction (USDC, USDI and DNR 1996a). In any event, as stated previously, specific prescriptions for such yarding will be developed jointly by the DNR and the Services and will be designed to assure proper riparian function.

The strategy for managing the amount of hydrologically mature forest is intended to prevent damage to salmonid habitat during peak flows associated with rain-on-snow events. The strategy follows the principles used to develop the 1991 emergency state Forest Practices rule on rain on snow. The prescriptions for the significant rain-on-snow zone and wetlands should minimize the

potential adverse effects of forest management on winter peak-flows and summer low-flows. (See Section C of Chapter III in the HCP; DNR, 1996a).

The effectiveness and validation monitoring and research will test assumptions made in some of the prescriptions, as well as monitor additional variables. Because these elements form the basis of adaptive management in this HCP, the incorporation of new information and the ability to change management strategy is assured. This flexibility is key to assuring this HCP will improve conditions for anadromous salmonids in the HCP area.

In spite of the prescribed timber activities under the HCP, adverse effects to salmonid habitat will continue to occur because past forest practices have left a legacy of degraded riparian ecosystems, deforested unstable hillslopes, and a poorly planned and maintained road network. The frequency and severity of these adverse effects will decrease through the HCP term as forests develop and the road network improves. The riparian conservation strategy, which includes active restoration of some riparian ecosystems and improvements to the road network, will serve to minimize and mitigate the adverse effects of past management.

Although instream habitat and riparian conditions are generally degraded throughout the HCP area, the measures taken in this HCP will maintain healthy riparian habitats and help to restore instream and riparian habitat across the five westside planning units and OESF. Specifically, the RMZs on fish-bearing streams will provide for the growth and development of a properly functioning riparian zone that will provide over the life of the HCP the following riparian functions: sufficient shade, bank stability, litter inputs for healthy nutrient supply, and a continual source of LWD for instream structural elements important to fish. Other prescriptions will minimize sediment inputs due to landslides, assess the condition of fish habitats and riparian stands, and monitor the effects of forest practices on aquatic habitats. Also, in accordance with the comprehensive landscaped-based road network, prescriptions will reduce sediment delivered to aquatic resources, and blockages to fish passage will be cleared and retrofitted. The effectiveness monitoring and research will test assumptions made in some of the prescriptions, as well as monitor additional variables. Because these elements form the basis of adaptive management in this HCP, the incorporation of new information and the ability to change management strategy is assured. This adaptive management strategy is key to assuring this HCP will improve conditions for anadromous salmonids in the HCP area.

(2) Non-Timber Resources

Rights-of-way

Any right-of-way that interfere with water courses important to fish life, is subject to the hydraulic code rules (WAC 220-110) and must obtain a hydraulics permit approval or HPA. The WDFW has the authority to condition any such permit activity. The hydraulics code and the WDFW authority to implement it protect anadromous salmonids from right-of-way interactions with stream crossings. NMFS acknowledges that potential adverse effects to anadromous salmonids

by construction of rights-of-way are minimized and mitigated to the maximum extent practicable by the HPA process. Issues associated with the timber harvest necessary to create rights-of-way and lead to increased access to other private timberlands are somewhat more complicated. The latter will be addressed in the indirect effects section of this document (section IV. C).

DNR has provided 9 years data (1983 to 1991) during which time approximately 2,100 permits were issued involving approximately 105 miles of new road and approximately 2,500 acres of timber harvest. This is an annual average of approximately 235 permits, 12 miles of new road, and 278 acres of timber harvest.

Assuming that this average is also applicable for the years since 1991, a total of 3275 permits, 165 miles of new road and 3,890 acres of associated timber harvest would have occurred since 1983. However, applying this average is likely misleading and an overstatement of the actual current situation. The resulting figures would not reflect the fact that many roads used during the harvest of timber in an area and are decommissioned at the end of that use; the number of miles of road decommissioned is not readily available. Additionally, a recent review of rights-of-way applications during 1994 and 1995 showed an annual average of 150 to 160, substantially less than the 235 average, possibly due to the fact that timber harvest levels are substantially lower now than the historic highs seen in the 1980s, requiring less need for access. Additionally, most new road construction involves smaller spur roads compared to longer roads that were being built as recently as the 1980s. Therefore, the 1996 level would be something less than 12 miles of new road constructed and 278 acres harvested, all of which would have been conducted according to state forest practices and federal law. The timber harvest that occurs on DNR lands associated with right-of-way construction will henceforth be conducted under the terms of the HCP, and the effects of this harvest will be minimized and mitigated by the HCP measures.

Firewood Cutting

Though RCW 76.20.010 allows that green trees can be harvested, there are other protections preventing such harvest. The conditions for DNR firewood cutting permits specifically state green timber, and standing dead timber (snags) cannot be felled. State law does not restrict the area of the removal, but the Regions can designate when and where removal can occur. Thus, DNR permit conditions assure firewood cutting will not affect riparian buffers nor degrade anadromous salmonid aquatic habitats. As such, NMFS finds the 1996 level of this activity to have no effect on anadromous salmonids.

Valuable Material Sales

Sand and Gravel

The sale of sand or gravel from these contracts is subject to SEPA. SEPA allows state agencies to comment though their comments are not binding on the permit agency, in this case the DNR. DNR also has a SEPA policy in place that applies to all surface mining, including sand and gravel.

This policy calls for the "...elimination of conditions that will...be hazardous to...fish...". Actual protections in place for sand and gravel mining include NPDES permits administered by the DOE (WAC 173-200), and the Surface Mining Act (RCW 78.44). The DOE issues permits only to those that can meet the state's surface and groundwater standards (WAC 173-201A and 200). DNR does not seek coverage for this activity in streams (aquatic lands), so NMFS need not make a finding that 1996 levels of this activity are de minimis. However, sand and gravel mining does occur in floodplains. DNR may restrict floodplain sand and gravel mining on a case by case basis, but there are no standard terms for this activity on DNR contracts or leases. Further, NMFS does not have information that 1996 levels of floodplain sand and gravel mining are de minimis. Since such mining can have severe effects to anadromous salmonid habitats, NMFS does not have sufficient information concerning sand and gravel mining on DNR-managed lands to be able to find that mining activities within riparian areas and the 100-year floodplain are sufficiently minimized and mitigated to allow a 70 to 100 year incidental take permit, when or if anadromous salmonids are listed under the ESA.

Prospecting Leases/Mining Contracts

The Surface Mining Act requires reclamation plan and a hydrogeologic evaluation for any mining that may occur in floodplains or in river and stream channels (this seems in conflict with the prohibition on mining in streams and riparian areas. The Metals Mining and Milling Operations Act has a screening process that excludes tailings facilities from 100 year floodplains. Also, heap leach extraction processes are under moratorium in Washington state. As above, instream mining occurs in aquatic lands, so it is not an activity subject to this HCP and will not be permitted at this time.

DNR may restrict floodplain mining on a case by case basis, but there are no standard terms for this activity on DNR contracts or leases. Further, NMFS does not have information that 1996 levels of floodplain mining are de minimis. Since such mining can have severe effects to anadromous salmonid habitats, NMFS does not have sufficient information concerning other mining contracts on DNR-managed lands to be able to find that mining activities within riparian areas and the 100-year floodplain are sufficiently minimized and mitigated to allow a 70 to 100 year incidental take permit, when or if anadromous salmonids are listed under the ESA.

Oil and Gas Leases

There is no oil or gas produced in the state of Washington, and most exploration activity occurred in the past. Substantive protections for streams and salmon are in place, and include no exploration or drilling within 200 ft. of stream types 1-4 (DNR Oil and Gas lease restrictions), as well as the surface and groundwater protections from the NPDES permit process. Also, it is unlikely that very many new oil and gas exploration activities will occur in the future on DNR lands as most terrestrial sources of oil and gas have been located and developed. Most exploration activity occurred earlier (1970's and 1980's) with little success. Because of the low

level of activity and the in place regulations and permit conditions, NMFS can reasonably agree that sufficient protections are in place for 1996 levels of this activity.

Off-road Vehicle Trails (ORV)

DNR has taken, and continues to take, a proactive approach in rehabilitating riparian ORV trails, including revegetation and trail maintenance and education of ORV users for proper ORV trail use and location of these trails. An example of this concern is the DNR's program in the Tahuya State Forest to develop and monitor measures that will mitigate these kinds of effects. Because of the DNR policies and efforts to eliminate this activity from riparian areas, NMFS agrees that the DNR measures and policies adequately treat this activity at 1996 levels. NMFS agrees with the DNR approach for riparian ORV trail use and relies on a continued proactive involvement of DNR to prevent riparian ORV use in the future and to restore those riparian habitats that have been destroyed by previous ORV use.

C. INDIRECT AND CUMULATIVE EFFECTS

Indirect effects are those that are caused by the action and are later in time but still relatively certain to occur (50 C.F.R. part 402.02). The action in this context is the issuing of an unlisted species agreement for anadromous salmonids, with provisions to grant the applicant, the Washington Department of Natural Resources, an incidental take permit under section 10(a)(1)(B) of the Endangered Species Act of 1973 when and if any of these anadromous salmonids are listed. This plan is for 70 to 100 years so most effects analyzed are considered as direct effects of the action.

However, the effects of actual use of new roads constructed as rights-of-way for timber operations, and the effect of enabling harvest of timber on other non-Federal lands, are both indirect effects of the HCP action. The HCP does not describe or analyze the effects of other non-Federal timber harvest to anadromous salmonids, so these effects cannot be analyzed here. It is incumbent upon all landowners to comply with the ESA, and avoid the taking prohibitions of section 9. If a landowner believes adverse effects to anadromous salmonids are likely, when and if anadromous salmonids are listed, the landowner should work with the NMFS to obtain the appropriate section 10 incidental take authorization. It is important to note that this HCP does not grant incidental take, or assurances regarding future take when anadromous salmonids are listed, associated with actions on lands accessed by these rights-of-way. Therefore, the indirect effects of right-of-way access to other non-Federal lands is not addressed in this analysis.

Cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation. The most relevant of these effects are problems associated with anadromous salmonid fishery management, and land management on state and private (i.e., non-Federal) land adjacent to the HCP planning units. One effect in this category would be increased fishing

pressure brought on by increased salmonid productivity resultant from the activities conducted in the HCP. Increased fishing pressure could result in increased vehicle traffic in the HCP plan area, which may slightly increase road generated sediment that could run into the stream as surface flow. It is also anticipated that other non-Federal activities will continue at the same level as in the past, or improve (such as an increase in non federal landowners constructing and working under HCP's). Additionally, Washington State Forest Practices may improve through (1) developing more protective rules (as witnessed by the recent November 14, 1996 passage of an emergency rule by the Washington Forest Practices Board to minimize the error in mistyping Type 4 and 5 waters); (2) Timber, Fish, and Wildlife's (TFW) recent and ongoing effort to establish new riparian policies and rules for consistency with Clean Water Act and Endangered Species Act; and (3) recent timber companies engaged with TFW to provide and operate under landscape plans which will provide certainty at the state, as well as the federal (under Section 10 of the ESA) level.

The conservation measures identified in this HCP minimize the impacts of timber harvest on 1.6 million acres of DNR land, and mitigate for impacts to anadromous salmonid species that may be affected by those activities. Therefore possible cumulative effects to anadromous salmonids will likely be decreased by this HCP, and habitat for sensitive life stages of anadromous salmonids will be either maintained, enhanced, or protected.

D. CONCLUSIONS

To make the determination that the proposed action will not jeopardize the continued existence of listed or proposed species, NMFS must consider the status of the species under the environmental baseline, and any associated direct, indirect or cumulative effects. A similar approach has been taken for anadromous salmonids addressed in this HCP as part of the Unlisted Species Analysis. This is necessary as DNR requests assurances (i.e. No Surprises Policy) that it will receive a Section 10 permit for westside anadromous salmonids adequately addressed in the HCP, when and if they are listed under the ESA. DNR seeks no such assurances for eastside anadromous salmonids.

Proposed Steelhead ESUs

(1) Lower Columbia River (proposed Threatened)

Timber Activities - This ESU is covered in part under the riparian management strategy of the HCP. The conservation measures identified in this HCP minimize the effects of timber harvest on the Columbia Planning Unit, and mitigate for impacts to anadromous salmonid species that may be affected by those activities. Therefore, possible cumulative effects to anadromous salmonids will be decreased by this HCP, and habitat for sensitive life stages of anadromous salmonids will be either maintained, enhanced, or protected. Thus, the proposed action within the Columbia Planning Unit will not reduce appreciably the likelihood of both the survival and recovery of this ESU of steelhead trout in the wild.

Non-Timber Activities - Sand and gravel mining, and hard rock mining. At the present time, NMFS does not have sufficient information concerning these mining activities on DNR-managed lands to be able to find that mining activities within riparian areas and the 100-year floodplain are sufficiently minimized and mitigated to allow a 70 to 100 year incidental take permit, when or if anadromous salmonids are listed under the ESA. DNR currently has up to 40 such contracts, with 15 to 20 contracts in forested areas for the sale of sand or gravel, affecting up to 1000 total acres. Sales under these contracts are subject to the State Environmental Policy Act (SEPA) and to DNR's SEPA policy for the elimination of conditions that are hazardous to fish. The measures needed to accomplish this are not described. DNR has advised NMFS that sand and gravel mining are subject to water quality permits administered by the Washington Department of Ecology. Additional protections in place for other mining contracts are discussed in Section V above. The conditions associated with the future permitting of these activities are found below in section VIII B.2.

(2) Upper Columbia River (proposed Endangered)

This ESU is not covered under the riparian management strategy of the HCP, nor does the DNR request coverage for steelhead on the Chelan Planning Unit, when and if steelhead are subsequently listed. Therefore, this analysis does not consider the effects of the HCP on this ESU of steelhead trout.

Westside Anadromous Salmonids (Coho, Chinook, Sockeye, Pink, Chum, Steelhead and Sea-Run Cutthroat trout)

Timber Activities - This section of DNR lands (1.3 million acres) is covered under the riparian management strategy of the HCP. The conservation measures identified in this HCP minimize and mitigate the impacts of timber harvest to anadromous salmonid species throughout the westside. Therefore possible direct, indirect and cumulative effects to anadromous salmonids will be decreased by this HCP, and habitat for sensitive life stages of anadromous salmonids will be either maintained, enhanced, or protected. Thus, the proposed action on westside riparian and aquatic habitats is not likely to reduce appreciably the likelihood of both the survival and recovery of westside anadromous salmonids in the wild, when or if they are listed.

Non-Timber Activities - Sand and gravel mining, and hard rock mining. At the present time, NMFS does not have sufficient information concerning these mining activities on DNR-managed lands to be able to find that mining activities within riparian areas and the 100-year floodplain are sufficiently minimized and mitigated to allow a 70 to 100 year incidental take permit, when or if anadromous salmonids are listed under the ESA. DNR currently has up to 40 such contracts, with 15 to 20 contracts in forested areas for the sale of sand or gravel, affecting up to 1000 total acres. Sales under these contracts are subject to the State Environmental Policy Act (SEPA) and to DNR's SEPA policy for the elimination of conditions that are hazardous to fish. The measures needed to accomplish this are not described. DNR has advised NMFS that sand and gravel mining are subject to water quality permits administered by the Washington Department of

Ecology. Additional protections in place for other mining contracts are discussed in Section V above. The conditions associated with the future permitting of these activities are found below in section VIII B.2.

VII. CONSERVATION RECOMMENDATIONS

Westside Anadromous Salmonids (Coho, Chinook, Sockeye, Pink, Chum, Steelhead and Sea-Run Cutthroat trout)

Timber Activities - No conservation recommendations apart from fully implementing the HCP to develop properly functioning riparian and aquatic habitats.

Non-Timber Activities - There are no conservation recommendations for these activities, except for compliance with the conditions associated with the future permitting of these activities that are found below in the Findings portion of this analysis (Section VIII B.2).

VIII. FINDINGS (and incidental take statement)

A. Although anadromous salmonids addressed in the HCP are not listed under the ESA at this time, this document is intended to provide the Washington Department of Natural Resources assurances that they will receive an Incidental Take Permit if and when such species are subsequently listed under the ESA, subject to the "extraordinary circumstances" clause in the IA. In order to issue an incidental take permit under 50 C.F.R. 222.22(c)(1) the NMFS must consider the following:

1. The status of the affected species or stocks;

The status of anadromous salmonids potentially affected by the DNR HCP has been considered above (see section III). This analysis examined the effects of the DNR HCP on proposed ESUs of steelhead trout, as well as unlisted anadromous salmonids on both the east and west sides of the Cascades.

2. The potential severity of direct, indirect and cumulative impacts on anadromous salmonids and their habitats as a result of the proposed activity;

The impacts of the DNR HCP were examined in some detail in this analysis (see section IV).

3. The availability of effective monitoring techniques;

Monitoring of the implementation of the DNR HCP and the effectiveness of the HCP prescriptions are a critical feature of this HCP. Monitoring reports will be completed and submitted to the NMFS and the USFWS by March 30 of each year. Details of this monitoring

program appear in Chapter V of the HCP. Substantive details of the monitoring plan will be developed by the interagency science team.

4. The use of the best available technology for minimizing or mitigating impacts;

The prescriptions established in this HCP represent the most recent developments in science and technology in minimizing and mitigating impacts to riparian and aquatic habitats, from road management to timber harvest protocols and practices. Further, the adaptive management component of this HCP assures new science and technology will continue to be employed in the HCP as it is developed.

5. The views of the public, scientists and other interested parties knowledgeable of the species or stocks or other matters related to the application.

Public comments were solicited on the completed permit application package and availability of a draft EIS by announcement April 5, 1996 in the Federal Register (61 FR 15297) (USDI 1996a). The comment period ended May 20, 1996, and during that time 132 written comments were received, and 41 comments were presented at 5 public hearings. Additional comments were received from several Native American Tribes after the comment period closed. Public comments were again solicited with the announcement of the Notice of Availability of the final EIS in the November 1, 1996, Federal Register (61 FR 56563) (USDI 1996b).

B. Having considered the above, the NMFS makes the following findings with regard to the adequacy of the HCP meeting the statutory and regulatory requirements for an Incidental Take Permit under Section 10(a)(2)(B) of the ESA and 50 C.F.R. 222.22(c)(2):

1. The taking of listed species will be incidental. The NMFS anticipates that the proposed action would likely result in incidental take of anadromous salmonids, if they were listed. Activities that will occur in the HCP area that may result in take may include "harm" through adverse changes in essential habitat features such as increased peak flows due to upslope harvesting, reduced LWD input due to harvest of riparian trees in non-fish-bearing streams, and additional sediment inputs due to landslides and road use throughout the planning area. Also, take may occur via the "harass" definition as well, by frightening or disturbing spawning fish during riparian yarding, road crossing or riparian management activities. Some instances of incidental take will likely occur despite the conservation measures in the HCP. These types of take are speculative and are not quantifiable. However, the likelihood of discovering instances of incidental take or enumerating the extent of the incidental take is small. In situations such as these, the NMFS designates the expected level of incidental take as "unquantifiable."

Any take of anadromous salmonids will be incidental to otherwise lawful forest management and incidental land use activities by DNR, specified in the HCP.

2. The Washington State Department of Natural Resources will, to the maximum extent practicable, monitor, minimize and mitigate the impacts of taking anadromous salmonids associated with timber management activities. Measures in this HCP minimize and mitigate for any take impacts that may occur, through riparian prescriptions (for example - designating no harvest areas on steep unstable slopes), and by the designation of RMZs throughout the HCP area in the five westside planning units and the OESF that assure attainment of properly functioning riparian habitats for fish-bearing streams during the plan term. Also, DNR will monitor and conduct research to test assumptions and to determine effectiveness of HCP prescriptions.

Sand and gravel mining and other mining contracts are a notable exception to this finding. At the present time, NMFS does not have sufficient information concerning the 1996 levels of impact resulting from sand and gravel mining on DNR-managed lands to be able to find that mining activities within riparian areas and the 100-year floodplain are sufficiently minimized and mitigated to allow a 70 to 100 year incidental take permit, when or if anadromous salmonids are listed under the ESA. DNR currently has up to 40 such contracts, with 15 to 20 contracts in forested areas for the sale of sand or gravel, affecting up to 1000 total acres. Sales under these contracts are subject to the State Environmental Policy Act (SEPA) and to DNR's SEPA policy for the elimination of conditions that are hazardous to fish. The measures needed to accomplish this are not described. DNR has advised NMFS that sand and gravel mining are subject to water quality permits administered by the Washington Department of Ecology. Additional protections in place for other mining contracts are discussed in Section V above.

Due to the lack of specific information on the location and intensity of mining activities in riparian areas and the 100 year floodplain, NMFS concludes that impacts to any anadromous fish resulting from such mining activities on DNR-managed lands will be covered by the unlisted species provisions of the IA only for a period ending on January 30, 1998. Thereafter, effects from sand and gravel mining or other mining contracts will not be covered by the unlisted species provisions of the IA unless DNR has provided additional information concerning the location of such activities, and the extent of their impacts to anadromous fish. This information is necessary for the NMFS to conclude that mining would be adequately minimized and mitigated for in the HCP, and would not appreciably reduce the likelihood of the survival and recovery of anadromous salmonid species in the wild.

Except as indicated above regarding sand and gravel mining and other mining contracts, the HCP and IA contain measures to monitor, minimize, and mitigate the impact of take of presently listed species under the permit.

3. Based upon the best available scientific information, the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Conservation measures identified in the plan will increase the quality and quantity of spawning and rearing habitat in the five westside planning units and OESF, and result in a benefit to anadromous salmonid species.

The Act's legislative history establishes the intent of Congress that this issuance criteria be based on a finding of "not likely to jeopardize" under section 7(a)(2) [see 50 C.F.R. 402.02]. This is the identical standard to Section 10(a)(2)(B). The conclusions regarding jeopardy for each proposed steelhead ESU and for all other unlisted anadromous salmonid are found in section VII. D. CONCLUSIONS above. In summary, the NMFS has considered the status of the species, the environmental baseline and the effects of the proposed action, and any indirect and cumulative effects, to conclude that issuance of the unlisted species agreement to DNR on timber activities for westside anadromous fish species, would not likely jeopardize the continued existence of the anadromous salmonids addressed in the HCP.

4. The plan has been revised to assure that other measures, as required by the NMFS has been met.

The HCP and IA incorporate all elements determined by the NMFS to be necessary for approval of the HCP and issuance of the permit.

5. The NMFS has received the necessary assurance that the plan will be funded and implemented.

Signing of the IA by DNR assures that the HCP will be implemented. DNR will ensure adequate funding for the HCP. Also, the HCP and IA commit DNR to adequately fund implementation of the HCP.

Conclusion - Based on these findings, except as stated in B.2 above, it is determined that the DNR HCP meets the statutory and regulatory requirements for an Incidental Take Permit under Section 10(a)(2)(B) of the ESA and 50 C.F.R. 222.22(c)(2). As such, all requirements of the NMFS are fulfilled and it is recommended that the Regional Administrator sign both the Implementing Agreement for the DNR HCP, and approve this analysis (i.e. the Endangered Species Act Section 7 Conference Report, Unlisted Species Analysis, and Section 10 Findings).

IX. PROCEDURES IN THE EVENT OF LISTINGS

As specified in the IA, should any of the currently unlisted species subsequently become listed, DNR may request an amendment to the incidental take permit to include such vertebrate species in the Plan Areas covered in the HCP. If an amendment request is received, the USFWS and/or NMFS will reinitiate consultation under Section 7 of the Act and initiate amendment of the HCP. Such an amendment will: (1) present relevant existing information on the status, trend or other information pertinent to the Plan Area; (2) estimate the amount of take and the impacts of such take; (3) describe the ongoing minimization and mitigation steps the applicant is taking or will take relative to that species; (4) describe any additional actions that were found to be necessary or appropriate to successfully complete an amendment for that species; and (5) explain how each of the issuance criteria described in Section 10(2)(B) are being met. Such amendment should cite the Federal Register documents used in proposed, emergency, or final listing; cite any pertinent draft recovery plan effort or similar management plans for the species or its habitats; and must

consider the other obligations of the Services as Federal agencies. It is expected that, upon listing of a currently unlisted species, additional information will be available in any proposed, final, or emergency listing to determine the habitat and life-history requirements of the species, the range-wide status, threats to the species, applicable management recommendations, and other basic information necessary to complete the amendment and initiation processes. Before such species would be added to the permit, the USFWS and NMFS must find that adding the species to the permit would not appreciably reduce the likelihood of survival and recovery of the affected species in the wild and would be consistent with its other responsibilities.

X. REINITIATION OF CONFERENCE

Based on the information in the DNR HCP, the NMFS anticipates an unquantifiable amount of incidental take could occur as a result of the action covered by this conference report. To ensure protection for a species assigned an unquantifiable level of take, reinitiation of this conference is required (1) if any action is modified in a way that causes an effect on the species that was not previously considered in the HCP and this report; (2) new information or project monitoring reveals effects of the action in a way not previously considered; or (3) a new species is listed or critical habitat is designated that may be affected by the action (50 C.F.R. 402.16).

XI. REFERENCES

- Allen, R.L. and T.K. Meekin. 1973. An evaluation of the Priest Rapids chinook salmon spawning channel, 1963-1971. Wash. Dept. Fisheries Technical Report 11:1-52 p.
- Anderson, N.H. and J.R. Sedell. 1979. Detritus processing by macroinvertebrates in stream ecosystems. *Annual Review of Entomology*. v.24, p.351-377.
- Bahls, P. and M. Ereth. 1994. Stream typing error in Washington water type maps for watersheds of Hood Canal and the southwest Olympic Peninsula. Point No Point Treaty Council, Kingston, WA.
- Becker, D.C. 1970. Temperature, timing, and seaward migration of juvenile chinook salmon from the central Columbia River. AEC Research and Development Report, Battelle Northwest Laboratories. Richland, WA. 21 pages.
- Bell, M.C. 1986. Fisheries handbook of engineering requirements and biological criteria. Army Corps of Engineers. 290 pages.
- Bell, M.C. 1990. Fisheries handbook of engineering requirements and biological criteria. Fish passage development and evaluation program, Corps of Engineers North Pacific Division. Portland, Oregon.

- Bell, M.C. 1991. Fisheries handbook of engineering requirements and biological criteria. Fish passage development and evaluation program, Corps of Engineers North Pacific Division. Portland, Oregon. *In* Bjornn and D.W. Reiser (1991).
- Beschta, R.L., R.E. Bilby, G.W. Brown, et al. 1987. Stream temperature and aquatic habitat: fisheries and forestry interactions. *In* E.O. Salo and T.W. Cundy, eds. Streamside management: forestry and fishery interactions. University of Washington, Institute of Forest Resources, Seattle. Contribution 57. p. 191-232.
- Bilby, R.E. and P.A. Bisson. 1992. Allochthonous versus authchthonous organic matter contributions to the trophic support of fish populations in clear-cut and old-growth forested streams. Canadian Journal of Fisheries and Aquatic Sciences, v.49, no.3, p. 540-551.
- Bishop, S. and A. Morgan, (editors). 1996. Critical habitat issues by basin for natural chinook salmon stocks in the coastal and Puget Sound areas of Washington State. Northwest Indian Fisheries Commission, Olympia, WA. 105 p. (Available from Northwest Indian Fisheries Commission, 6730 Martin Way E., Olympia, WA 98506.)
- Bjornn, T.C., D.R. Craddock and D.R. Corley. 1968. Migration and survival of Redfish Lake, Idaho, sockeye salmon, Oncorhynchus nerka. Transactions of the American Fisheries Society 97:360-373.
- Bottom, D.L., P.J. Howel, and J.D. Rodgers. 1985. The effects of stream alterations on salmon and trout habitat in Oregon. Oreg. Dep. Fish Wildl., Portland, Or. 70 p. (Available from ODFW, P.O. Box 59, Portland, OR, 97207.)
- Bugert, R., P. LaRiviere, D. Marbach, S. Martin, L. Ross, and D. Geist. 1990. Lower Snake River compensation plan salmon hatchery evaluation program 1989 annual report. Report to the U.S. Fish and Wildlife Service, Cooperative Agreement 14-16-0001-89525, 145 p. Available from U.S. Fish and Wildlife Service, 4696 Overland Road, Room 560, Boise, ID 83702.
- Busby, P.J., Thomas C. Wainwright, Gregory J. Bryant, Lisa J. Lierheimer, Robin S. Waples, F. William Waknitz, and Irma V. Lagomarsino. 1996. Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. U.S. Dept. Commerce, NOAA, NMFS. 261 pages.
- Bustard, D.R. and D.W. Narver. 1975. Aspects of the winter ecology of juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead trout (*Salmo gairdneri*). J. Fish. Res. Board Can. 32:667-680.
- Cannamela, D.A. 1992. Potential impacts of releases of hatchery steelhead trout "smolts" on

wild and natural juvenile chinook and sockeye salmon. A white paper, Idaho Development of Fish and Game, Boise, ID.

- Cederholm, C.J. 1994. A suggested landscape approach for salmon and wildlife habitat protection in western Washington riparian ecosystems. *In* A.B. Carey and C. Elliott, eds. Washington forest landscape management project: progress report. Washington Department of Natural Resources, Olympia. p. 78-90.
- Conners, M.E. and R.J. Naiman. 1984. Particulate allochthonous inputs: relationships with stream size in an undisturbed watershed. *Canadian Journal of Fisheries and Aquatic Sciences*. v.41, no.10, p. 1473-1484.
- Department of Natural Resources, Washington 1996. Draft Habitat Conservation Plan. March 1996. Olympia, WA.
- Dunne, T. and L.B. Leopold. 1987. Water in environmental planning. W.H. Freeman and Company, San Francisco. 818 p.
- Erman, D.C., J.D. Newbold, and K.B. Roby. 1977. Evaluation of streamside buffer strips for protecting aquatic organisms. University of California, California Water Resources Center, Davis, CA. Contribution no. 165. 48 p.
- Forest Ecosystem Management Assessment Team (FEMAT). 1993. forest ecosystem management: an ecological, economic, and social assessment: report of the Forest Ecosystem Management Team. U.S. Department of Agriculture, Forest Service; U.S. Department of Commerce; U.S. Department of the Interior; and U.S. Environmental Protection Agency, Washington D.C. 1 vol.
- Giger, R.D. 1972. Ecology and management of coastal cutthroat trout in Oregon. Oregon State Game Commission, Fishery Research Rep. 6. 61 pages.
- Glova, G.J. 1978. Pattern and mechanism of resource partitioning between stream populations of juvenile coho salmon (*Oncorhynchus kisutch*) and coastal cutthroat trout (*Salmo clarki clarki*). Ph.D. Dissertation, University of Victoria, Victoria B.C. 105 p.
- Godfrey, H. 1965. Coho salmon in offshore waters, p. 1-39. *In*: Salmon of the North Pacific Ocean. Part IX. Coho, chinook, and masu salmon in offshore waters. Int. North Pac. Fish. Comm. Bull. 16.
- Gratowski, H.J. 1956. Windthrow around staggered settings in old-growth Douglas-fir. *Forest Science*. v.2, no.1, p.60-74.

- Gregory, S.V., G.A. Lamberti, D.C. Erman, et al. 1987. Influence of forest practices on aquatic production. In E.O. Salo and T.W. Cundy, eds. Streamside management: forestry and fishery interactions. University of Washington, Institute of Forest Resources, Seattle. Contribution 57. p.233-255.
- Hale, S.S. 1981. Freshwater habitat relationships for chum salmon (*Oncorhynchus keta*). Alaska Dept. Fish and Game, Anchorage. Contract Rep. No. 14-16-0009-79-119. 90 pages. In Pauley et al. (1988).
- Hart, J.L. 1973. Pacific Fishes of Canada. Fish. Res. Board Canada. 740 pages.
- Heard, W.R. 1991. Life history of pink salmon (*Oncorhynchus gorbuscha*). In C. Groot and L. Margolis (editors), Pacific salmon life histories, p. 121-230. Univ. British Columbia Press, Vancouver.
- Hicks, B.J., R.L. Beschta, and R.D. Harr. 1991. Long-term changes in streamflow following logging in western Oregon and associated fisheries implications. Water Resources Bulletin, v. 27, no. 2, p. 217-226.
- Howell, P., K. Jones, D. Scarnecchia, L. LaVoy, W. Knedra, and D. Orrmann. 1985. Stock assessment of Columbia River anadromous salmonids. Vol: I. U.S. Dept. Energy, Bonneville Power Administration. Project No. 83-335, 558 p.
- Johnston, J.M. 1981. Life histories of anadromous cutthroat with emphasis on migratory behavior, P. 123-127. In E.L. Brannon and E.O. Salo (eds.) Salmon and Trout Migratory Behavior Symposium. University of Washington, Seattle, WA.
- Jones, D.E. 1976. Steelhead and sea-run cutthroat trout life history in southeast Alaska. ADFG, Sport Fish Div., Annual Performance Rep. 17(42): 29-55. (Available: P.O. Box 240020, Douglas, AK 99824).
- King, J.E. 1968. Site index curves for Douglas-fir in the Pacific Northwest. Weyerhaeuser Company, Forestry Research Center, Centralia, WA. Weyerhaeuser forestry paper no. 8. 49 p.
- Koski, K.V. 1975. Adaptive and behavioral responses to artificial propagation in a stock of chum salmon, *Oncorhynchus keta*. Pages 309-312. In W.J. McNeil and D.C. Himsworth (eds.). Salmonid ecosystems of the North Pacific. Oregon State University Press, Corvallis. In Nickelson et al. (1992a).
- Kostow, K. 1995. Biennial report on the status of wild fish in Oregon. Oreg. Dep. Fish Wildl. Rep., 217 p. + appendix. (Available from ODFW, P.O. Box 59, Portland, OR, 97207.)

- Landino, S.W. 1996. Note to the file on the Washington State Department of Natural Resources Habitat Conservation Plan regarding Non-Timber Resources.
- Landino, S.W. 1997. Second note to the file on the Washington State Department of Natural Resources Habitat Conservation Plan regarding Non-Timber Resources.
- Lynch, J.A., E.S. Corbett, and K. Mussallem. 1985. Best management practices for controlling nonpoint-source pollution on forested watersheds. *Journal of Soil and Water Conservation*. v.40, no.1, p. 164-167.
- Marshall, A.R., C. Smith, R. Brix, W. Dammers, J. Hymer, and L. LaVoy. 1995. Genetic diversity units and major ancestral lineages for chinook salmon in Washington. *Wash. Dep. Fish Wildl. Tech Rep.* 6, 29-37 p. (Available from WDFW, 600 N. Capitol Way N., Olympia, Washington, 98501).
- McDade, M.H., F.J. Swanson, W.A. McKee, et al. 1990. Source distances for coarse woody debris entering small streams in western Oregon and Washington. *Canadian Journal of Forest Research*. v.20, no.3, p.326-330.
- Meehan, W.R., and T.C. Bjornn. 1991. Salmonid distributions and life histories. Pages 47-82 in W.R. Meehan (ed.), *Influences of forest and rangeland management on salmonid fishes and their habitats*. *Am. Fish. Soc. Spec. Pub. No. 19*. Bethesda, Maryland. 751 pages.
- Moring, J.R. 1982. Decrease in stream gravel permeability after clear-cut logging: an indication of intragravel conditions for developing salmonid eggs and alevins. *Hydrobiologica*. v.88, p.295-298.
- Murphy, M.L. 1995. *Forestry Impacts on Freshwater Habitat of Anadromous Salmonids in the Pacific Northwest and Alaska--Requirements for Protection and Restoration*. NOAA Coastal Ocean Program Decision Analysis Series No. 7. NOAA Coastal Ocean Office, Silver Spring, MD. 156 pages.
- National Marine Fisheries Service 1995. *Federal Register*: July 25, 1995, Volume 60, Number 142, pages 38011-38030.
- National Marine Fisheries Service 1996. *Federal Register*: August 9, 1996, Volume 61, Number 155, pages 41541-4156.
- Nehlsen, W.J., J.E. Williams, and J.A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington. *Fisheries*. v.16, no.2, p.4-21.

- Nickelson, T.E., J.W. Nicholas, A.M. McGie, R.B. Lindsay, D.L. Bottom, R.J. Kaiser, and S.E. Jacobs. 1992a. Status of anadromous salmonids in Oregon coastal basins. Unpublished manuscript. Oregon Department of Fish and Wildlife, Research and Development Section, Corvallis, and Ocean Salmon Management, Newport. 83 pages.
- Nickelson, T.E., J.D. Rodgers, S.L. Johnson, and M.F. Solazzi. 1992b. Seasonal changes in habitat use by juvenile coho salmon (*Oncorhynchus kisutch*) in Oregon coastal streams. *Canadian Journal of Fisheries and Aquatic Sciences* 49:783-789.
- Palmisano, J.F., R.H. Ellis, and V.W. Kaczynski. 1993. The impact of environmental and management factors on Washington's wild anadromous fish. Washington Forest Protection Association and Washington Department of Natural Resources, Olympia. 371 pages.
- Pauley, G.B., K.L. Bowers, and G.L. Thomas. 1988. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Northwest) -- chum salmon. U.S. Fish Wild. Serv. Biol. Rep. 82(11.81). U.S. Army Corps of Engineers, TR EL-82-4. 17 pages.
- Perry, C.A. and T.C. Bjornn. 1991. Examination of the extent and factors affecting downstream emigration of chinook salmon fry from spawning grounds in the upper Salmon River. Unpublished report, Idaho Cooperative Fish and Wildlife Research Unit, University of Idaho, Moscow.
- Reeves, G.H., F.H. Everest, and J.D. Hall. 1987. Interactions between the redbside shiner (*Richardsonius balteatus*) and the steelhead trout (*Salmo gairdneri*) in western Oregon: the influence of water temperature. *Canadian Journal of Fisheries and Aquatic Sciences*. 44:1603-1613.
- Reiser, D.W. and T.J. Bjornn. 1979. Habitat requirements of anadromous salmonids. Pages 1-54 in W.R. Meehan(ed.), *Influences of forest and rangeland management on salmonid fishes and their habitats*. Am. Fish. Soc. Spec. Pub. No. 19. Bethesda, Maryland. 751 pages.
- Richardson, J.S. 1992. Coarse particulate detritus dynamics in small, montane streams of southwestern British Columbia. *Canadian Journal of Fisheries and Aquatic Sciences*. v.49,no.2, p.337-346.
- Salo, E.O. 1991. Life history of chum salmon. Pages 233-309 in C. Groot and L. Margolis (eds.), *Pacific salmon life histories*. Univ. British Columbia Press, Vancouver. 564 pages.
- Schroder, S.L. 1973. Effects of density on the spawning success of chum salmon (*Oncorhynchus keta*) in an artificial spawning channel. M.S. Thesis. University of Washington, Seattle. 78 pages. In Pauley et al. (1988).

- Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Bull. Fish. Res. Board Can. 966 pages.
- Sumner, F.H. 1972. A contribution to the life history of the cutthroat trout in Oregon. Oregon State Game Commission, Corvallis, OR. 142 pages.
- Swanston, D.N. 1991. Natural process. *In* W.R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society, Bethesda, MD. Special publication no. 19. p.139-179.
- Van Sickle, J. and S.V. Gregory. 1990. Modeling inputs of large woody debris to streams from falling trees. Canadian Journal of Forest Research. v.20, no.1, p.130-137.
- Washington Department of Fisheries (WDF), Washington Department of Wildlife (WDW), and Western Washington Treaty Indian Tribes (WWTIT). 1993. 1992 Washington State salmon and steelhead stock inventory (SASSI). Wash. Dep. Fish Wildl. Olympia, 212 pages + 5 regional vols. (Available Washington Department Fish and Wildlife, 600 N.Capitol Way, Olympia, Wa 98501).
- USDC, USDI, and DNR. 1996a. Draft Environmental Impact Statement Habitat Conservation Plan. March 22, 1996. Olympia, WA.
- USDC, USDI, and DNR. 1996b. Final Environmental Impact Statement Habitat Conservation Plan. October 25, 1996. Olympia, WA.
- USDI. 1996a. Endangered and threatened species permit application; Notice of availability of a draft Environmental Impact Statement and receipt of an application for an incidental take permit for threatened and endangered species on lands managed by the Washington State Department of Natural Resources within the range of the northern spotted owl. Fish and Wildlife Service and National Marine Fisheries Service. Federal Register Vol. 61:15297. April 5, 1996.
- USDI. 1996b. Endangered and threatened species permit application; Final Environmental Impact Statement for an incidental take permit for threatened and endangered species on lands managed by the Washington State Department of Natural Resources within the range of the northern spotted owl. Notice of Availability. Fish and Wildlife Service and National Marine Fisheries Service. Federal Register Vol. 61:56563-565565. November 1, 1996.
- Washington Forest Practices Board. 1995. Washington forest practices: rules, WAC 222, board manual (watershed manual not included), Forest Practices Act, RCW 76.09. Washington Forest Practices Board, Olympia. 1 v.

- Weitkamp, L.A., T.C. Wainwright, G.J. Bryant, G.B. Milner, D.J. Teel, R.G. Kope, and R.S. Waples. 1995. Status review of coho salmon from Washington, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-24, Northwest Fisheries Science Center, Seattle, Washington. 258 p.
- Wilderness Society. 1993. Pacific salmon and federal lands: a regional analysis. Wilderness Society, Washington D.C. the living landscape, v.2: Ecological salmon report. 88 p.
- Wydoski, R.S. and R.R. Whitney. 1979. Inland Fishes of Washington. University of Washington Press, Seattle. 220 p.